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STORAGE

REPORT  
OF  
THE DIRECTOR  
OF THE  
ROYAL OBSERVATORY, HONGKONG,  
FOR THE YEAR  
1917



HONGKONG  
PRINTED BY NORONHA & CO.  
GOVERNMENT PRINTERS

1918





# REPORT OF THE DIRECTOR OF THE ROYAL OBSERVATORY, HONGKONG, FOR THE YEAR 1917.

## I.—GROUNDS AND BUILDINGS.

The grounds were kept in order by the Botanical Department with the assistance of the Observatory coolies.

## II.—METEOROLOGICAL INSTRUMENTS.

*Kew Barograph.*—With the new glass rod for the temperature compensation it was found that the instrument was under-corrected for temperature. The compensation was adjusted on 1918, January 16.

*Beckley Anemograph.*—This instrument was oiled once a month, and the orientation of the head checked occasionally.

*Dines Anemograph.*—The head was oiled once a month, and the spindle of the float cleaned and oiled once a week. The orientation of the head was checked monthly. On July 31 one-inch suction and pressure tubes were substituted for the original half-inch tubes, in order to obtain a more reliable record of gusts. The small bore cocks have not yet been changed.

The monthly results of comparisons with the records of the Beckley Anemograph since the installation of the Dines instrument, in April 1910, are given below :—

Month.	Factor (Dines $\div$ $\frac{\text{Beckley}}{3}$ ).							
	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.
January, ...	.....	2'33	2'30	2'12	2'54	2'03	2'08	2'04
February, .	.....	2'34	2'32	2'30	2'40	2'06	2'23	2'04
March, ....	.....	2'30	2'35	2'25	2'33	2'04	2'26	2'02
April, .....	.....	2'27	2'33	2'26	2'25	2'05	2'33	2'05
May, .....	2'23	2'25	2'34	2'22	2'13	2'23	2'36	1'97
June, .....	2'23	2'10	2'44	2'09	2'13	2'22	2'26	1'93
July, .....	2'14	2'21	2'57	2'28	2'26	2'05	2'80	2'02
August, ...	2'07	2'25	2'65	2'39	2'18	2'07	2'88	1'93
September,	2'18	2'31	2'49	2'81	2'22	2'19	2'21	2'07
October, ...	2'30	2'27	2'51	2'69	2'08	2'23	2'10	2'00
November,	2'28	2'27	2'47	2'71	2'08	2'08	2'04	1'67
December,	2'23	2'31	2'24	2'54	2'07	2'07	2'10	1'68
Year, .....	2'21	2'29	2'42	2'39	2'22	2'11	2'30	1'95



The small factors in November and December indicate that either the velocities recorded by the Beckley instrument are too great, or by the Dines instrument too small. The mean velocities for October, November, and December, as recorded by the Beckley Anemograph, were respectively 0.4, 0.6, and 0.5 m.p.h. below normal. This does not suggest that the instrument was recording relatively greater velocities in November and December than in October. Moreover, it is unlikely, for mechanical reasons, that after a great number of years the instrument should suddenly commence to record too great velocities. The other alternative is that the Dines instrument is recording too small velocities, but of this the condition of the instrument gives no indication. Had the change occurred in August it might have been attributed to the change in the pipes on July 31, but it will be seen that the mean factor for May to July was practically the same as for August to October.

*Thermometers.*—All thermometers in use were compared with the Kew Standard in winter and summer.

*Thermograph.*—The Richard dry and wet bulb thermograph, ordered to replace the old Kew photographic thermograph, was received on March 20, and set up in the thatched shelter the following day. The recording cylinder is 5 inches in diameter, and turns once in 24 hours. The electrical time-break apparatus was completed on April 22. The pens are lifted from the paper, for the first three minutes of each hour, by a make-contact on one of the electric dials. The thermometers are aspirated from the 59th to the 60th minute of each hour by a fan, operated by a similar contact on another dial, air being drawn into the shelter through a 14-inch zinc pipe. Comparison between the eye observations of thermometers rotated in the open air and the records of the Richard thermograph indicate that the relation between the temperature in the shelter and in the open air is not constant. The precise nature of the variation has not yet been investigated.

Interesting records of the effect of the electric fan on the wet bulb thermometer are being classified under varying conditions of temperature, humidity, and wind.

### III.—METEOROLOGICAL OBSERVATIONS AT THE OBSERVATORY.

Continuous photographic records showing the variations of barometric pressure were obtained with the Kew barograph, and automatic records of the direction and velocity of the wind with a Beckley and a Dines-Baxendell anemograph, modified as described in the Report for 1912. The amount of rain is recorded automatically by a Beckley and a Nakamura pluviograph, the amount of sunshine by a Campbell-Stokes universal sunshine recorder, and the relative humidity of the air by a small Richard hair hygograph. Since March 21 automatic records of the temperature of the air and of evaporation have also been obtained with a Richard dry and wet bulb thermograph.

Eye observations of barometric pressure, temperature of the air and of evaporation, and the amount of cloud were made at each hour of Hongkong Standard time. The character and direction of motion of the clouds were observed every three hours. Daily readings were taken of self-registering maximum and minimum thermometers.

*Principal Features of the Weather in 1917.*—The principal features of the weather in 1917 were the heavy rains from July 10 to 29, when 30·06 inches fell, a general defect of wind velocity, and a typhoon which passed a few miles to the north of the Observatory on August 13.

Barometric pressure was considerably below normal in April and considerably above normal in January. The mean pressure for the year was 29<sup>ins.</sup>·845, as against 29<sup>ins.</sup>·832 in 1916 and 29<sup>ins.</sup>·844 for the past 34 years. The highest pressure was 30<sup>ins.</sup>·494 on January 10, as against 30<sup>ins.</sup>·332 in 1916 and 30<sup>ins.</sup>·509 for the past 34 years. The lowest pressure was 29<sup>ins.</sup>·078 on August 13, as against 29<sup>ins.</sup>·304 in 1916 and 28<sup>ins.</sup>·735 for the past 34 years.

The temperature of the air was considerably below normal in January and December, and moderately above normal in September. The mean temperature for the year was 71°·0, as against 71°·8 in 1916 and 71°·8 for the past 34 years. The highest temperature was 90°·8, on July 13, as against 92°·4 in 1916 and 97°·0 for the past 34 years. The lowest temperature was 38°·8, on January 9, as against 39°·3 in 1916 and 32°·0 for the past 34 years.

The wind velocity was below normal in each month of the year. It has been below normal every month since August 1911, except in July 1914 and February 1916. There has been a gradual increase however, relatively to the normal, since June. This may possibly indicate the end of the long negative wave. There is still considerable uncertainty as to whether this wave is a meteorological phenomenon or is due to a change in the anemograph factor. The mean velocity for the year was 11·2 m.p.h., as against 12·2 m.p.h. in 1916 and 12·8 for the past 34 years. The maximum velocity for one hour, as recorded by the Beckley Anemograph, was 63 miles, at 15<sup>h</sup> on August 13, as against 55 miles in 1916 and 108 miles for the past 34 years. The maximum squall velocity, as recorded by the Dines-Baxendell Anemograph, was at the rate of 93 m.p.h., at 14<sup>h</sup>·20<sup>m.</sup> on August 13, as against 65 m.p.h. in 1916 and 105 m.p.h. for the past 7 years.

*Rainfall at Four Stations.*—In the following table the monthly rainfall at the Observatory is compared with the fall at the Police Station, Taipo; the Botanical Gardens; and the Matilda Hospital, Mount Kellet:—



Months.	Observatory (Kowloon).	Police Station (Taipo).	Botanical Gardens (Hongkong).	Matilda Hospital (Hongkong).
	<i>inches.</i>	<i>inches.</i>	<i>inches.</i>	<i>inches.</i>
January, ....	0·345	0·61	0·46	0·44
February, ...	0·405	0·95	0·49	0·91
March, .....	2·670	3·07	3·13	2·82
April, .....	5·230	8·64	5·93	5·79
May, .....	9·685	12·52	9·31	9·60
June, .....	11·540	19·36	10·17	12·79
July, .....	30·075	25·17	32·66	25·98
August, .....	11·950	13·26	12·12	8·57
September,...	4·880	4·82	5·11	5·29
October, .....	3·470	2·53	3·77	1·34
November, ...	0·095	—	0·12	0·01
December, ...	1·140	2·16	1·24	1·12
Year,...	81·485	93·09	84·51	74·66

*Floods.*—The heaviest rainfall occurred at the Observatory as follows :—

Period.		Amount.	Duration.
		<i>Inches.</i>	<i>Hours.</i>
May	15 <sup>d</sup> 21 <sup>h</sup> to May 17 <sup>d</sup> 22 <sup>h</sup> ... ..	6·015	29
July	14 20 „ July 17 4 ... ..	13·910	24
July	23 6 „ July 29 9 ... ..	15·310	63
August	12 10 „ August 14 9 ... ..	6·315	17

*Drought.*—A somewhat serious drought which commenced on November 1 and has lasted up to the date of this report, was broken by a fall of 1·14 inch of rain from December 13<sup>d</sup> 1<sup>h</sup> to 15<sup>d</sup> 6<sup>h</sup>.

*Typhoons.*—The centre of a typhoon passed a few miles to the north of the Observatory at about noon on August 13. The maximum hourly wind velocity recorded at the Observatory by the Beckley Anemograph was 63 miles at 15<sup>h</sup>, and the greatest squall velocity (Dines-Baxendell Anemograph) was at the rate of 93 m.p.h. at 14<sup>h</sup> 20<sup>m</sup>. At Victoria Peak the Beckley Anemograph recorded 100 miles between 15<sup>h</sup> and 16<sup>h</sup>.

The tracks of 17 typhoons and 3 of the principal depressions which occurred in the Far East in 1917 are given in two plates in the Monthly Meteorological Bulletin for December 1917.

#### IV.—PUBLICATIONS.

*Daily Weather Report and Map.*—A weather map of the Far East and the Daily Weather Report, containing meteorological observations, usually at 6<sup>h</sup> and 14, from about 40 stations

in China, Indo-China, Japan, the Philippines, and Borneo, and daily weather forecasts for Hongkong to Gap Rock, the Formosa Channel, the south coast of China between Hongkong and Lam-mocks, and between Hongkong and Hainan, were issued as in former years. Copies of the map were exhibited on notice boards at the Hongkong Ferry Pier, the Blake Pier, and the Harbour Office. One copy was sent daily to the Director of the Meteorological Observatory, Macao. Forty copies of the Daily Weather Report were distributed to various offices, etc., in the Colony, and a copy was sent daily to the Director of the Meteorological Observatory, Macao. Copies were sent every week to Lieutenant-Commander Pradiyat, Royal Siamese Navy.

A charge of \$10 a year is made for supplying private firms and individuals with the Daily Weather Report, and \$36 for the Weather Map. No map was published on July 14 and 15, August 4, 12, 13, and 14, and December 16, owing to the late arrival of the weather telegrams.

The weather forecast is telegraphed daily to the Cape d'Aguilar Wireless Station in time for distribution at 1 p.m.

*Monthly Meteorological Bulletin.*—The Monthly Meteorological Bulletin, which includes the Daily Weather Report, was published as usual, but distribution to the United Kingdom, Europe, and India was discontinued in October owing to the war.

*Miscellaneous Returns.*—A monthly abstract of observations made at the Observatory is published in the *Government Gazette*, and daily, monthly, and yearly results are published in the Blue Book in the form suggested by the London Meteorological Office for the British Colonies.

The monthly departure from normal of the barometric pressure at four China Coast Ports were communicated to the Commonwealth Meteorologist, Melbourne, in connection with long range weather forecasts. Monthly meteorological returns are forwarded to Symons's Meteorological Magazine, and annual returns to the Stock Exchange Year Book and the Colonial Office List.

#### V.—WEATHER TELEGRAMS, FORECASTS, AND STORM WARNINGS.

*Daily Weather Telegrams.*—Owing to the war, and the disturbed state of China, the service of daily weather telegrams from the various reporting stations was erratic; particularly in the case of Central and Southern China, Indo-China, Japan, and Vladivostock.

Thanks to the Director of the Philippines Weather Bureau, who kindly made the necessary arrangements with the Philippines Naval Authorities, the 6 a.m. observations from Guam, in the Ladrone Islands, have been received regularly since May 16.



*Extra Weather Telegrams.*—The following stations send extra weather telegrams at half-rates during typhoons, on receipt of certain code words from Hongkong :—Amoy, Canton, Macao, Phulien, Sharp Peak, and Taihoku. The Director of the Philippines Weather Bureau also sends extra telegrams, at his discretion, from Aparri or some other station nearer the typhoon centre.

The extra 9 p.m. telegram usually received from Swatow during the typhoon season, was frequently lacking, owing probably to the disturbed condition of the country.

*Wireless Weather Telegrams.*—The development of this service has been impeded by the war. Wireless weather telegrams have been received from Japanese and Dutch ships, however, as follows :—

Month.	Dutch.	Japanese.
January, .....	9	7
February, .....	11	2
March, .....	5	3
April, .....	6	2
May, .....	6	4
June, .....	8	3
July, .....	9	2
August, .....	12	2
September, .....	7	2
October, .....	9	2
November, .....	4	2
December, .....	7	6
Totals 1917, .....	93	37
Totals 1916, .....	95	60

*Results of Weather Forecasts.*—The results of the comparison of the daily weather forecasts with the weather subsequently experienced are given below, with the results of the previous five years :—

Year.	Complete Success.	Partial Success.	Partial Failure.	Total Failure.
	%	%	%	%
1912	62	34	3	1
1913	66	28	3	3
1914	62	32	5	1
1915	54	37	8	1
1916	67	29	3	1
1917	67	29	4	0



*Storm Warnings.*—In view of the urgent need of an improved service of storm warnings, new Local and Non-Local Storm Signal Codes were introduced on July 1.

The Non-Local code supersedes the “China Coast” code and the “Hongkong Telegraphic Code”. The signals are made by means of ten symbols representing the ten numerals. They are displayed at the yard arms of the Storm Signal mast on Signal Hill, Kowloon.

The following information is given :—

- (a) Position of centre, in degrees of latitude and longitude ; by 4 symbols at one yard arm.
- (b) Direction and velocity of motion, and the time ; by 3 symbols at the other yard arm.

Monsoon Gales are signalled by 3 symbols at one yard arm. The top symbol indicates the region threatened, the middle symbol the direction from which the gale is expected, and the bottom symbol the time at which gale conditions were first indicated.

Warnings in accordance with this code are telegraphed to the following Ports:—Sharp Peak and Santuao (Foochow), Taihoku (Formosa), Swatow, Macao, Canton, Pakhoi, Hoihow, Phulien, Manila, Labuan, and Singapore.

The new Local code of Storm Signals is the complement of the Non-Local code. The latter gives the position of the typhoon and its direction and velocity of motion, while the former indicates the probable direction and force of the wind likely to be experienced at Hongkong.

To a certain extent Signal 1 of the new code corresponds to the red, and signals 2 to 5 to the black signals of the old code. Signal 7 is the same as the urgent signal of the old code, and Signal 6 is new.

There are four main signals :—

No. 1 A “Stand By” signal.

Nos. 2-5 A warning that a gale may be expected from one of four directions.

No. 6 A warning that the gale is expected to increase.

No. 7 A warning that a gale of typhoon force may be expected.

Distinctive day symbols are assigned to each of the four main signals ; the four directions of signals 2 to 5 being represented respectively by a cone point upwards for North, a cone point downwards for South, a ball for East, and a drum for West.

The night signals, which consist of three vertical electric lights, were designed on the following principles :—

- (1) That red shall indicate the greatest danger and white the least.
- (2) That of the two upper lights white shall represent west and green east.

- (3) That the top light shall indicate the first of two directions.
- (4) That where possible, *i.e.*, in signals 2 and 3, for the bottom light, green shall represent North, and white South. Thus, signal 2 being NW to NE the top light is white, the middle green, and the bottom green. Signal 3 being SE to SW, the top light is green the middle white and the bottom white. Signal 4 being NE to SE the two top lights are green, leaving no choice for the bottom light, which must be white. This is no disadvantage, as the signal has both north and south components, and so the bottom light can have no directional significance. Similarly for Signal 5 (NW-SW), the top lights of which must be white. This leaves no choice for the bottom light, which must be green.

The introduction of a white light is necessary in order to provide distinctive signals for the four main signals.

The local day signals are displayed at the masthead of the Storm Signal mast, Kowloon, and are repeated at the Harbour Office, H.M.S. "Tamar", Green Island, the Godown Company, Kowloon, Lyemun, and Lai-Chi-Kok. The night signals are displayed on the tower of the Railway Station, Kowloon, and repeated at the Harbour Office and on H.M.S. *Tamar*.

The day signals, if necessary, are displayed simultaneously with the non-local signals, and both remain until an order to change or lower is received from the Observatory.

For the benefit of native craft and passing ocean vessels, a cone is exhibited at several outlying stations during the time that any of the local signals are displayed in the Harbour, to indicate that there is a depression somewhere in the China Sea, and that a typhoon warning is displayed in the Harbour.

In the following table are given the number of hours the local signals were hoisted in each of the years 1912-1917 :—

Year.	Red Signals.	Black Signals.	Bombs.*
	Number of hours.		Number of times fired.
1912	151	164	...
1913	146	189	1
1914	146	178	...
1915	64	120	...
1916	70	201	1
1917	102	36	...

\* Three bombs fired at intervals of 10 seconds indicate that winds of typhoon force are anticipated.



The figures in the above table include the number of hours that night signals, corresponding to the day signals, were hoisted.

Formerly the red signals indicated that the centre of the typhoon was believed to be more than 300 miles distant, and the black less than 300 miles, the returns for 1912-1916 are therefore not strictly comparable with those for 1917. The latter suggest however that the use of the new local storm warning code has already saved the Colony a considerable amount of money. The loss incurred by the disorganisation of the work in the harbour, consequent upon the display of black typhoon signals, is not easy to estimate. It probably amounts to many thousands of dollars a day, however.

#### VI. METEOROLOGICAL OBSERVATIONS FROM SHIPS. TREATY PORTS, &c.

*Logs received.*—In addition to meteorological registers kept at about 40 stations in China, meteorological logs were received from 85 ships operating in the Far East. These logs, representing 3,767 days' observations, have been utilised for verifying typhoon tracks. The corresponding figures for the year 1916 were 158 and 7,456.

No progress has been made with the construction of Pilot Charts owing to the absence on leave of the First Assistant.

*Comparison of Barometers.*—During the year about 600 comparisons of ships' barometers have been made by means of observations taken when in harbour, and several direct comparisons of barometers for shipmasters and various persons in the Colony have been made at the Observatory.

On June 11, Mr. B. G. Tours, C.M.G., H.B.M. Consul at Ichang, brought an aneroid barometer to the Observatory to be tested. He had been making observations with it at altitudes of several thousand feet, while on a government mission through China. It was found that at a true pressure of 25·52 the barometer read 0·37 too high, and at 29·63 it read 0·61 too low. Mr. Tours was supplied with a table of corrections applicable to the readings of his barometer over different portions of the scale.

#### VII.—MAGNETIC OBSERVATIONS.

Absolute determinations of magnetic horizontal force and declination were made near the middle of each month with a Kew pattern magnetometer, Elliott No. 55, and of dip with a Kew pattern dip circle, Dover No. 71, four dip needles being used in rotation. A complete determination of horizontal force consists of one set of vibrations taken between two sets of deflections.

The mean values of the Magnetic elements for the years 1916 and 1917 were as follows:

	1916	1917
Declination (east) .....	0° 13' 48"	0° 13' 10"
Dip (northy) .....	30° 51' 51"	30° 50' 22"
Horizontal Force (C.G.S. unit) ..	0·37135	0·37163
Vertical Force (C.G.S. unit) ..	0·22205	0·22188
Total Force (C.G.S. unit) .....	0·43284	0·43282

# VIII.—TIME SERVICE.

*Time Ball.*—The Time Ball on the Signal Hill, Kowloon, is dropped daily at 13<sup>h</sup>, Hongkong Standard Time (5<sup>h</sup> a.m. of Greenwich Time). The ball is also dropped at any other hour in case of necessity. One application for a supplementary time signal was made in the year 1917.

The ball was dropped successfully 347 times. There were three failures:—On January 28th the trigger was found to be displaced and it was impossible to place the ball upon it before 13<sup>h</sup>. On April 15 the ball dropped at about 30 seconds before 13<sup>h</sup>, owing to an electrical defect. On October 13 the ball failed for no ascertainable cause. There was no fault at 14<sup>h</sup> when the ball fell correctly.

The apparatus was under repair from June 16-29.

The ball fell with an error of 0<sup>s</sup>·3, or less, on 327 occasions, and with an error of 0<sup>s</sup>·4 or 0<sup>s</sup>·5 on 11 occasions. Errors of 0<sup>s</sup>·6 occurred three times, 0<sup>s</sup>·9 twice, and 0<sup>s</sup>·7, 0<sup>s</sup>·8, 1<sup>s</sup>·0, and 1<sup>s</sup>·3 once each.

The probable error of the Time Ball was 0<sup>s</sup>·01 less than in 1916, which was the best year on record up to that date. The monthly values for the past 5 years are given below:—

Month.	Probable Error of Time Ball.				
	1913	1914	1915	1916	1917
January, .....	±0 <sup>s</sup> ·20	±0 <sup>s</sup> ·18	±0 <sup>s</sup> ·17	±0 <sup>s</sup> ·15	±0 <sup>s</sup> ·17
February, .....	·21	·15	·44	·28	·10
March, .....	·34	·21	·17	·17	·11
April, .....	·21	·22	·38	·18	·18
May, .....	·11	·25	·16	·10	·17
June, .....	·10	·16	·15	·17	·10
July, .....	·17	·20	·17	·10	·21
August, .....	·15	·21	·15	·10	·11
September, .....	·10	·14	·13	·11	·10
October, .....	·12	·14	·10	·13	·10
November, .....	·17	·13	·16	·13	·10
December, .....	·26	·28	·14	·11	·10
Means, .....	±0 <sup>s</sup> ·20	±0 <sup>s</sup> ·19	±0 <sup>s</sup> ·19	±0 <sup>s</sup> ·14	±0 <sup>s</sup> ·13

*Transit Instrument.*—Observations for time were made daily with the 3-inch transit instrument and the Hipp tape chronograph by the Chinese computers, weather permitting.

The number of observations in the years 1916 and 1917 were as follows:—

	1916.	1917.
Transits .....	1,778	1,924
Level determination, .....	890	952
Azimuth .....	34	44
Collimation .....	33	40



Stars were observed on each night between September 4 and October 27, inclusive. This is apparently a record for Hongkong and reflects great credit on the observers. The period included several cloudy nights on which opportunities for observing might easily have been missed.

Transits of the sun were only observed when star transits were not available from the previous night.

The azimuth and collimation determinations were made by the Director and the Chief Assistant. The azimuth determinations depend usually on observations of the old south mark.

*Clocks.*—The performance of the Standard Sidereal clock Dent No. 39741 has again been exceptionally good. Its rate varied from  $+0^{\text{m}}.04$  on January 11 (Bar.  $30^{\text{m}}.41$ , Temp.  $54^{\circ}.1$ ) to  $-0^{\text{m}}.58$  on August 5 (Bar.  $29^{\text{m}}.59$ , Temp.  $83^{\circ}.6$ ). The rate during cloudy periods was partly derived from the formula:—

$$r = r_0 + 0.4 (p - p_0) + 0.00392 (t - t_0),$$

where  $r$  is the losing rate at pressure  $p$ , in inches, and temperature  $t$ , in degrees Fahrenheit, and  $r_0$  the losing rate at pressure  $p_0$  and temperature  $t_0$ .

It was found however that the rate could not be accurately computed from this formula after rapid changes of temperature and pressure, and until the clock is properly mounted in an underground room there will always be considerable uncertainty at times as to its rate.

In the following table is given the excess of the observed over the inferred rate after cloudy periods in the year 1917:—

Date 1917.		Interval without observations.	Excess of observed over inferred error.
January	8	6 days	-0.091
March	3	4 "	+0.006
"	13	3 "	-0.019
"	27	4 "	+0.004
April	19	7 "	-0.010
"	26	5 "	+0.063
May	19	4 "	-0.014
"	27	3 "	+0.042
June	24	3 "	+0.010
July	24	3 "	+0.027
"	29	4 "	+0.094
November	1	3 "	+0.016
December	1	3 "	-0.006
"	17	6 "	-0.012

The mean time clock, Dent No. 39749, which was fitted with an invar pendulum in 1915, has kept a fairly satisfactory rate throughout the year. A discussion of the monthly rates for 1916, using a barometer coefficient of 0.4, gave a temperature coefficient of 0.0421 decrease of losing rate for an increase of 1° (F) of temperature, and this is corroborated by the 1917 rates.

The Brock clock has been used throughout the year for dropping the Time Ball and for driving dials in various parts of the building. In spite of the invar pendulum fitted in 1914, the rate has been erratic at times, after keeping remarkably steady for several days. The clock is corrected daily by the electric regulating apparatus and its daily rate is usually kept below 0.5 by the addition or removal of weights to or from the pendulum.

Since 1916 March 23 an hourly time signal has been sent to the Water Police Station, the General Post Office, and the Cable Company's Office, along the lines used for the telephone or telegraph instruments, by means of apparatus designed by the Government Electrician. An electro-magnet receives a current every hour from the mean time clock and, by means of contacts on the armature, short-circuits these lines for about 0.8 second.

*Batteries.*—The necessary current for the time service, etc., has been satisfactorily supplied by the accumulator battery, charged as found necessary from the alternating mains of the China Light & Power Co. through a Nodon valve. The charge lasts from 4 to 7 days, according to the state of the atmosphere. A duplicate valve similar to that constructed by Messrs. Jeffries and Evans in 1915, was ordered from the Hongkong & Whampoa Dock Company and brought into use on April 17. The two valves have been used alternately since that date. Occasional troubles have been experienced owing to local impurities in the aluminium electrodes; but the experience of the past year tends to show that these valves have a very high degree of efficiency, if care is taken to keep the electrodes and connections of the valve clean and the precipitation removed about every two months. It also appears that the valves are not large enough. When charging a small battery at 2 amperes the efficiency was considerably higher than when charging the main battery, which requires 4 amperes.

*Time Signals by Wireless Telegraphy.*—The mast for the wireless time-signal installation was completed by the Taikoo Dock Company in October. It is a steel lattice mast 150 feet high, of triangular section. The installation was not completed by the end of the year, as the wire, etc., for the antennæ, which was ordered in May 1917 was not received till January 1918.

#### IX. SPECIAL INVESTIGATIONS.

*The Wind at Victoria Peak.*—The tabulation of the anemograph records at Victoria Peak, Hongkong, is being continued. It is proposed to discuss the results for the years 1914-18 in conjunction with those at the Observatory, Kowloon.



*Sympiesometer Observations.*—In order to test the popular belief in the sympiesometer as a weather forecaster, and to ascertain, if possible, what the instrument actually records, a simple form of the instrument was set up in the thermograph shelter and hourly readings taken from September 15, 1916, to September 30, 1917. The following characteristics were noted :—

- (1) The height of the crystals in the liquid.
- (2) Whether the surface of the crystals was flat and undisturbed.
- (3) Whether the upper portion of the crystals, when disturbed, was conical, or in horizontal, vertical, or inclined flakes.
- (4) Whether the flakes were :—
  - (a) inclined at various angles,
  - (b) closely packed,
  - (c) well separated.
- (5) The bearing from the centre of the glass tube of the highest point of the disturbed portion of the crystals.

The observations have not yet been discussed, but from a preliminary examination it would appear that :—

- (a) the instrument gives a rough idea of the humidity of the air, with a varying lag.
- (b) it is useless for forecasting rain.
- (c) the variations in the height and character of the crystals diminish with age.

#### X.—MISCELLANEOUS.

In the month of May the question of a Daylight Saving Measure for Hongkong was referred by Government to the Director of the Observatory, who recommended the adoption of 135th meridian time, in place of 120th meridian time, provided the Chinese and Philippines Governments would make a similar change. A memorandum showing the advantages to be derived from such a measure was forwarded to the above Governments; but neither were able to accept the proposal.

*Staff.*—No change occurred in the European staff during the year. Mr. B. D. Evans, First Assisant, was seconded for Military Service. He left the Colony on February 10 and was posted to the 3rd Field Survey Company, Royal Engineers, on April 25.

The Director acted as a censor of cables throughout the year, and Mr. Jeffries, the Chief Assistant, from January 1 to March 11.

Lam Kai-tseung, 5th Grade Computer, was promoted to the 4th Grade on May 4. Leung Sui-sang, 5th Grade Computer, was promoted to 4th Grade Clerk in the Public Works Department on April 15. In consequence, Chan Iu-fong, 6th Grade Telegra-

phist, was promoted to 5th Grade Computer, and Cheng Wa-so was appointed 6th Grade Telegraphist.

*Expenditure.*—The annual expenditure on the Observatory for the past ten years is as follows :—

Year.	Total Expenditure.	Increase.	Decrease.
	\$ c.	\$ c.	\$ c.
1908	21,110.61	1,000.08	.....
1909	22,388.63	1,278.02	.....
1910	21,787.55	.....	601.08
1911	23,353.02	1,565.47	.....
1912	22,595.08	.....	757.94
1913	24,255.49	1,660.41	.....
1914	25,398.31	1,142.82	.....
1915	23,233.12	.....	2,165.19
1916	21,977.78	.....	1,255.34
1917	26,890.50	4,912.72	.....

*Acknowledgments.*—Acknowledgments are here made to the Directors of Weather Services in the Far East, and the Chinese Maritime Customs authorities, for daily observations, and extra observations during typhoon weather ; to the Telegraph Companies for transmitting the observations free of charge ; to the commanders of vessels who have furnished meteorological observations by post and by wireless telegraphy, and to the Observatory staff for the manner in which they have carried out their respective duties.

T. F. CLAXTON,  
*Director.*

1918, February 22.







